

RELAYS - HIGH SPEED.

3/401... AND 3/402... SINGLE CONTACT TYPE.

ADJUSTMENTS.

(Replaces Issue 2, 1954.)

1. INTRODUCTION.

- 1.1 The adjustments described in this Instruction apply to High Speed Relays types 3/401..., and 3/402..., and to the equivalent Siemens (now AEI) types i.e. Nos. 88, 89, 99 and 113.
- 1.2 The two relay types are almost identical, the only differences are concerned with the coil; 3/401..., has a single coil and 3/402..., has two coils and a larger tag assembly. Fig. 1 shows the plan view of 3/402; for details refer Drawing CE.60077 and CE.60078.
- 1.3 Relays 3/401 and 3/402 are in general, comparable with the superseded Siemens (AEI) types No. 73 and 85, however the following differences can exist:-
Relays 3/401 and 3/402.
 - (i) Are "current" adjusted. (Red Label.)
 - (ii) Have their coil spools held in position by a clip.
 - (iii) Have a different tag numbering.
 - (iv) Have a break contact screw incorporating a ratchet device similar to the tensioning screw.
- 1.4 Contact material on all these relays may be platinum or platinum-iridium. Platinum contacts are identified by a single notch in the end of the spring whilst platinum-iridium is identified by two notches.

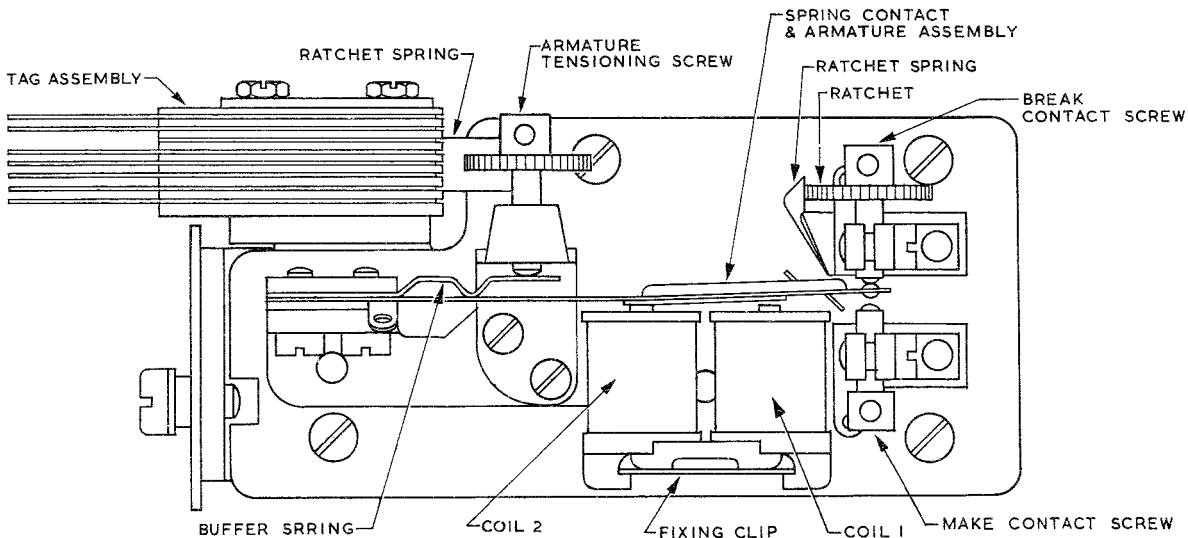


FIG. 1. HIGH SPEED RELAY TYPE 3/402... .

2. COMMENTS.

- 2.1 The current values, listed in Appendix 1 and 2, apply when checks or readjustments are being made and this data must be consulted before commencing maintenance. Where Siemens (AEI) adjustment cards are held, these may be used.
- 2.2 No permanent alterations are to be made to the standard adjustments without first obtaining approval from Headquarters. However, it may be necessary to try out slight modifications to the standard adjustments before submitting a report of the results.
- 2.3 Adjustments are to be made in accordance with the methods described in the following paragraphs of Section 3 and in that order.
- 2.4 Where the instructions specify the armature to be electrically operated, the specified saturate current figure is to be used; this figure should not be exceeded.
- 2.5 The contact screws must be a smooth friction fit in the contact pillars when all adjustments are being made. This is to prevent any loss in adjustment when the contact locking screws are finally tightened.
- 2.6 Disconnect and remove the relay from its mounting before replacing any worn or damaged parts.

3. STANDARD ADJUSTMENTS.

3.1 Preliminary.

- (i) Check that all baseplate-fixing screws are tight.
- (ii) Check that the coils are firmly secured by the fixing clip.
- (iii) Check that the tension of the ratchet-spring against the knurled edge of the armature tensioning screw is between 50 to 100 grammes.
- (iv) Check that the tension of the ratchet-spring against the knurled edge of the break contact screw is between 50 to 100 grammes. Earlier relays were fitted with a break contact screw without this ratchet.

3.2 Alignment.

- (i) Withdraw the tensioning screw until it is clear of the buffer spring.
- (ii) Check that the buffer spring rests against the tensioning-screw bracket and that it is clear of the contact spring.
- (iii) Check that the buffer spring is aligned with the contact spring so that pressure will be evenly applied across the contact spring. Where a projection is provided at the centre of the buffer spring, this is to bear on the centre of the contact spring.
- (iv) Check the contacts to ensure they are not more than one-third of a contact diameter out of alignment.
- (v) Loosen the contact-locking screws and withdraw the make and break contacts clear of the lever spring contacts.
- (vi) Check that the contact spring is straight up to the armature and that from there on, there is approximately a 3° set towards the break contact.
- (vii) Check that the armature rests lightly in contact with and parallel to the rear pole face.
- (viii) When adjustment is necessary remove the contact spring fixing screws and use Bent Duckbill Pliers (tool No.211). Re-assemble with the aid of Fine Taper-Nose Pliers (tool No.220) to hold the components in position. Before tightening the fixing screws check for buffer spring alignment 3.2(iii) and contact alignment 3.2(iv). The elongated fixing holes enable the necessary movement to be achieved.

3.3 Residual Gap. Set the residual gap (2-3 mils) by reference to the contact clearance (4-5 mils) as described below, unless otherwise specified:-

- (i) Relays without the break-contact ratchet adjustment:-
 - (a) Operate the armature electrically.
 - (b) Advance the make-contact screw until it just touches the spring contact. This point should be determined electrically by means of the Current-flow Test Set.
 - (c) Check that the slightest withdrawal of the make-contact disconnects the tester circuit. Leave the contacts just touching.
 - (d) Insert a 5-mil feeler gauge between the break-contact and the spring contact, and advance the break-contact, until the gauge is just gripped between the contacts.
 - (e) Remove the 5-mil gauge and check that a 4-mil gauge passes freely between the contacts.
 - (f) Release the armature.
 - (g) Advance the make-contact until it just makes contact with the spring contact. Check as in 3.3(i)(b) and (c).
 - (h) Tighten the make-contact locking-screw.
 - (j) Withdraw the break-contact clear of the lever-spring contact.
- (ii) Relays with the break-contact ratchet adjustment. Note that one notch on the periphery of the break-contact screw is equivalent to 0.5 mil traverse of the contact.
 - (a) Operate the armature electrically.
 - (b) Advance the break-contact until it just touches the spring contact. This point should be determined electrically by means of the Current-flow Test Set.
 - (c) Check that withdrawal of the break-contact, by one notch, disconnects the tester circuit. Leave the contacts just touching.
 - (d) Retract the break-contact screw by nine notches.
 - (e) Release the armature.
 - (f) Advance the make-contact until it just touches the spring contact.
 - (g) Check that the slightest withdrawal of the make-contact disconnects the tester circuit. Leave the contacts just touching.
 - (h) Tighten the make-contact locking screw.

3.4 Contact Opening. Set the contact opening at 4 to 5 mils as described below, unless otherwise specified:-

- (i) Relays without the break-contact ratchet adjustment:-
 - (a) With the armature released, insert a 5-mil feeler gauge between the make-contact and the spring contact.
 - (b) Advance the break-contact until the gauge is just gripped between the contacts.
 - (c) Remove the 5-mil gauge and check that a 4-mil gauge passes freely between the contacts.
 - (d) Tighten the break-contact locking-screw.
 - (e) Check contact opening.

(ii) Relays with the break-contact ratchet adjustment:-

- (a) Check that withdrawal of the break-contact, by one notch, disconnects the circuit between the make-contact and the spring contact. Leave the contacts touching.
- (b) Retract the break-contact screw by nine notches.
- (c) Tighten the break contact locking-screw.

3.5 Break-Contact Pressure. Set the break-contact force at 12 to 24 grammes, to ensure the correct contact pressure, as described below.

- (i) Advance the tensioning-screw until the contact spring rests against the break-contact with a pressure that resists 15 grammes and moves with 21 grammes, unless the adjustment data specified a contact force other than 12 to 24 grammes. In the latter case, the contact force should be adjusted towards the mean of the specified values. The contact force should be measured at the centre of the tip of the contact spring. If the 3^o set in the contact spring has been correctly applied the required contact pressure will be obtained without excessive bowing of the lever-spring between the rear pole face and the fixing point of the spring.

3.6 Current Tests. Readjust relays 3/401... and 3/402..., to their readjust values:-

- (i) Check the performance of the relay against the current values specified on the relay adjustment data.

Make the current tests in the following order - Saturate; Hold; Release; Non-Operate; and Operate.

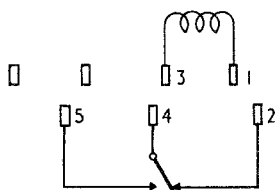
- (ii) If the current figures are met, the relay adjustment is completed.
- (iii) If the current figures are not met, vary the break-contact force, within the limits specified on the relay adjustment data, until the required current conditions are satisfied. If limits of break-contact force are not specified, assume a range of 12 to 24 grammes.
- (iv) If the current figures cannot be met within the specified range of break-contact force, re-check the residual gap and contact opening.
- (v) If it is not possible to meet the current figures within the specified tolerances, change the relay.

4. TOOLS.

4.1 The following tools are required for adjusting single-contact-unit High-Speed Relays:-

<u>Tool No.</u>	<u>Description</u>
139	Gauge, thickness, 0.0015" to 0.015"
154	Gauge, tension, 4-24 grammes.
152	Gauge, tension, 50-250 grammes.
211	Pliers, bent duckbill.
220	Pliers, fine taper nose.

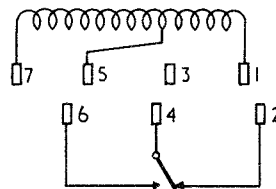
4.2 The tools specified must be used only for the purpose for which they are intended. Do not use tools that might cause damage to screws, nuts or springs.



REAR VIEW OF TAG ALLOCATION

APPENDIX 1.

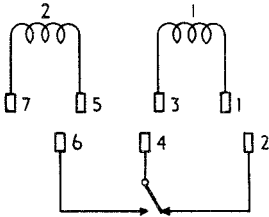
RELAYS TYPE 3/401...



REAR VIEW OF TAG ALLOCATION
FOR TAPPED COIL.

Relay Code	Coil		Current Values (MA)								Siemens Equivalent		Remarks	
	Code	Resist (Ohms)	Sat.	TEST				RE-ADJUST				Early Type		Improved Type
				Hold	Rel.	Non-Op.	Op.	Hold	Rel.	Non-Op.	Op.			
3/401A	1/SCO/479	145	90		9.5	22	26		10.0	23	25	73A	88A	Supersedes 3/401D
3/401B	9/SCO/479	500	58	32		24	37	30		25	35	73B	88B	Max. Contact Force 30 gms.
3/401C	2/SCO/479	1,000	41		5.2		15		5.5		14	73C	88C	
3/401D	1/SCO/479	145										73D	88D	Superseded by 3/401A
3/401E	3/SCO/479	100	100			23	34			24	32	73E	88E	
3/401F	4/SCO/479	35 (Tag 1-5) 35+110 (Tag 1-7)	220 82	53	38		95		50	40	90	73F	99A	Not to be used for new work.
3/401G	10/SCO/479	800	41		5.2	7.6	15		5.5	8.0	14	73G	88G	Max. Contact Force 30 gms.
3/401J	10/SCO/479	800	41		7.1		17		7.5		16	73J	88J	Not to be used for new work.
3/401K	5/SCO/479	500										73K	88K	Superseded by 3/401S.
3/401L	6/SCO/479	75	120			26	42			27	40	73L	88L	Max. Contact Force 30 gms.
3/401N	12/SCO/479	1,700	27		2.9		8.5		3.1		8.0		88Y	
3/401P	13/SCO/479	3	550		61		180		65		170		88X	Max. Contact Force 30 gms.
3/401R	17/SCO/479	24	230			47	68			50	65	73R	88R	
3/401S	5/SCO/479	500	48		5.2	8.5	15		5.5	9.0	14.0		88AF	Supersedes 3/401K

Relay Code	Coil		Current Values (MA)								Siemens Equivalent		Remarks	
	Code	Resist (Ohms)	Sat.	TEST				RE-ADJUST				Early Type		Improved Type
				Hold	Rel.	Non-Op.	Op.	Hold	Rel.	Non-Op.	Op.			
3/401T	23/SCO/479	1,600	29		4.2	5.7	9.5		4.5	6.0	9.0		88AG	
3/401U	1/SCO/479	145	90		11.5		27		12		26		88AJ	
3/401V	24/SCO/479	15	270			57	74			60	70		88AE	
3/401W	25/SCO/479	210	70		7.6	16	23		8	17	22		88AK	Max. Contact Force 30 gms.
3/401X	26/SCO/479	40	188			36	46			38	44		88AL	
3/401Y	7/SCO/479	50	140			26.5	33			28	31.5		88AU	
3/401Z	6/SCO/479	75	120		18		40		19		38			
3/401AA	14/SCO/479	11	300		40		87		42		84		88AT	
3/401AC	28/SCO/479	5.5	460		46	88	131		49	93	125		88AX	
3/401AE	10/SCO/479	800	41	6.0	4.4		9.6	5.7	4.6		9.1		88AM	Adjust Break Contact Pressure to meet current Figures.
3/401AF	12/SCO/479	1,700	27			7.1	8.8			7.4	8.3			
3/401AG	31/SCO/479	5.5	410	92	40		115	88	42		109			
3/401AH	24/SCO/479	15	270		40		89		42		84		88AP	Max. Contact Force 30 gms.
3/401AJ	32/SCO/479	200	100		11.1		27.8		11.6		26.4			
3/401AAA	10/SCO/479	800	41	10		7.1	13	9.5		7.5	12			Adjust Break Contact Pressure to meet current Figures.



APPENDIX 2.

RELAYS TYPE 3/402...

REAR VIEW OF TAG ALLOCATION

Relay Code	Coil			Current Values (MA)										Siemens Equivalent		Remarks
	No.	Code	Resist (Ohms)	Coil	Sat.	TEST				RE-ADJUST				Early Type	Improved Type	
						Hold	Rel.	Non-Op.	Op.	Hold	Rel.	Non-Op.	Op.			
3/402A	1	11/SCO/479	260	1+2	33		3.8		12		4.0		11	85A	89A	
	2	11/SCO/479	260													
3/402B	1	5/SCO/479	500											85B	89B	Superseded by 3/402G
	2	5/SCO/479	500													
3/402C	1	2/SCO/479	1,000	1+2	24			4.7	8.0		5.0	7.5	85C	89C		
	2	2/SCO/479	1,000													
3/402D	1	15/SCO/479	50	1	170			38	51		40	48	85D	89D		
	2	7/SCO/479	50			1//2										
3/402E	1	15/SCO/479	50	1	170			38	51		40	48	85E	89E		
	2	12/SCO/479	1,700			2										
3/402F	1	16/SCO/479	850	1+2	19		2.4		6.8	2.5		6.5	85F	89F		
	2	16/SCO/479	850													
3/402G	1	5/SCO/479	500	1+2	24		2.8		8.5	3.0		8.0	85G	89G	Supersedes 3/402B	
	2	5/SCO/479	500													
3/402H	1	3/SCO/479	100	1+2	50		5.2		17		5.5	16	85H	89H		
	2	3/SCO/479	100													
3/402J	1	1/SCO/479	145										85J	89J	Superseded by 3/402F	
	2	5/SCO/479	500													
3/402K	1	7/SCO/479	50	1	140	36				34			85K	89K		
	2	7/SCO/479	50													
3/402L	1	12/SCO/479	1,700	1+2	14		1.4		4.5		1.5	4.3	85L	89L		
						1										
	2	12/SCO/479	1,700	2	27		2.8		9.7	3.0	9.2					
3/402M	1	14/SCO/479	11	1	300		33		84	35		80	85M	89M		
	2	10/SCO/479	800			2										
3/402N	1	8/SCO/479	1.8	1	820			190	240		200	230		89AK		
	2	3/SCO/479	100			2										
3/402P	1	1/SCO/479	145	1	90		11		29	12		27		89CL	Supersedes 3/402J	
	2	5/SCO/479	500			2										

Relay Code	Coil			Current Values (MA)										Siemens Equivalent		Remarks
	No.	Code	Resist (Ohms)	Coil	Sat.	TEST				RE-ADJUST				Early Type	Improved Type	
						Hold	Rel.	Non-Op.	Op.	Hold	Rel.	Non-Op.	Op.			
3/402Q	1	7/SCO/479	50													Superseded by 3/402V
	2	7/SCO/479	50													
3/402R	1	20/SCO/479	7	1	420			95	130			100	120		89BE	
	2	2/SCO/479	1,000	2	41				17				16			
3/402S	1	20/SCO/479	7	1	420			102	125			107	119	85X	89X	
	2	13/SCO/479	3	2	550	160			210	150			200			
3/402T	1	19/SCO/479	7	1	460	63	48			60	50				89BH	Contact Force 12-17 gms.
	2	18/SCO/479	120	1+2	88			15	28			16	26			
3/402U	1	5/SCO/479	500	1	48				15			6.5	14		89BG	
	2	5/SCO/479	500	2	48				18				17			
3/402V	1	7/SCO/479	50	1+2	69	19		14	23	18		15	22		89BD	Supersedes 3/402Q
	2	7/SCO/479	50													
3/402W	1	22/SCO/479	26	1	210				38	63		40	60		89BS	
	2	12/SCO/479	1,700	2	27					7.0						
3/402X	1	22/SCO/479	26	1	210				50	62		53	59		89BN	
	2	22/SCO/479	26	2	210					75			71			
3/402Y	1	12/SCO/479	1,700	1	27		2.9		8.1		3.1		7.7			
	2	21/SCO/479	330	2	55	16					15					
3/402Z	1	6/SCO/479	75	1//2	130			15		38		16	36		89BY	
	2	6/SCO/479	75													
3/402AA	1	1/SCO/479	145	1	90				11.5	27		12	26			
	2	16/SCO/479	850	2	38					14			13			
3/402AB	1	22/SCO/479	26	1+2	120			12	23	33		13	24	31	89AE	
	2	22/SCO/479	26													
3/402AC	1	24/SCO/479	15	1+2	130				38	40		34	38		89BA	
	2	24/SCO/479	15													
3/402AD	1	7/SCO/479	50	1+2	69			11.5		25		12	24		89CD	Max. Contact Force 30 gms.
	2	7/SCO/479	50													
3/402AE	1	5/SCO/479	500	1	48			5.7	11.0	13.5		6	11.5	13	89AQ	
	2	5/SCO/479	500	2	48					17			16			
3/402AF	1	12/SCO/479	1,700	1+2	14			2.3	3.5	5.2		2.4	3.7	4.9	89CH	Max. Contact Force 30 gms.
	2	12/SCO/479	1,700													
3/402AG	1	3/SCO/479	100	1	100				11	28		12	27		89BJ	
	2	24/SCO/479	15	2	270					90			85			
3/402AH	1	1/SCO/479	145	1	90				9.5	26		10	25		89Y	
	2	12/SCO/479	1,700	2	27					10			9.5			
3/402AJ	1	27/SCO/479	15	1	330			47	105	131		50	110	125	89BX	
	2	17/SCO/479	24	2	230					79			75			

Relay Code	Coil			Current Values (MA)										Siemens Equivalent		Remarks
	No.	Code	Resist (Ohms)	Coil	Sat.	TEST				RE-ADJUST				Early Type	Improved Type	
						Hold	Rel.	Non-Op.	Op.	Hold	Rel.	Non-Op.	Op.			
3/402AK	1	1/SCO/479	145	1	90			19	24			20	23			
	2	1/SCO/479	145	2	90			21	30			22	29			
3/402AL	1	26/SCO/479	40	1	190	44				42					89CQ	Max. Contact Force 30 gms.
	2	12/SCO/479	1,700	1+2	26		4.3		10		4.6		9.5			
3/402AN	1	7/SCO/479	50	1	140	20	11.4			19	12.0				89CT	Contact Force 12-17 gms.
	2	29/SCO/479	630	1+2	41			6.3	12.0			6.6	11.0			
3/402AP	1	19/SCO/479	7	1	460	63	48			60	50				89CW	
	2	18/SCO/479	120	1+2	88			15	28			16	26			
3/402AQ	1	30/SCO/479	20	1	250			63	78			66	74			Max. Contact Force 30 gms.
	2	12/SCO/479	1,700	2	27				10.3				9.8			
3/402AR	1	27/SCO/479	50	1	140			15	33		15.5		31			
	2	27/SCO/479	50	2	140				39				37			
3/402AS	1	13/SCO/479	3	1+2	330			39	90		41		85			
	2	8/SCO/479	1.8													
3/402AU	1	33/SCO/479	145	1+2	45			9.5	12			10	11.4			
	2	33/SCO/479	145	2	82				22				21			
3/402AV	1	20/SCO/479	7	1	430			113	139			119	132			Max. Contact Force 30 gms.
	2	13/SCO/479	3	2	550				212				202			
3/402AW	1	34/SCO/479	300	1	55			14	18			15	17			
	2	12/SCO/479	1,700	2	26				11				10			
3/402AX	1	3/SCO/479	100	1+2	50			10.4	12.8			11	12.2			
	2	3/SCO/479	100													
3/402AY	1	20/SCO/479	7	1	430			102	125			107	119			Max. Contact Force 30 gms.
	2	12/SCO/479	1,700	2	26	8.5				8						
3/402AZ	1	33/SCO/479	145	1	82	17				16						Max. Break Contact Force 30 gms.
	2	33/SCO/479	145	1+2	41		6.6		15		7.0		14			
3/402AAB	1	6/SCO/479	75	1	120	28	20			27	21					Max. Contact Force 30 gms.
	2	7/SCO/479	50	2	140				58				55			
3/402AAC	1	A47901	400	1+2	31	4.5			7.3	4.3			6.9			
	2	A47901	400													

END.